

App. No. 10/065,738
Amendment dated October 17, 2003
Reply to Office action of July 18, 2003

REMARKS

Summary of Amendments

Claims 1, 3-6, 8, and 10-21 are pending in this application. Independent claims 1 and 6 have been amended to recite that the claimed dielectric multi-layer films are "disposed on *each*"—not *either*—side of the claimed magneto-optical section. These independent claims have also been amended to include language clarifying the inventive feature that the arrangement of the especially configured dielectric multi-layer films and magneto-optical section is predetermined to create a *selectively* resonant structure. In addition, claim 5 has been amended as required by the Examiner. Finally, claim 16 has been amended to recite that the claimed diamond-like carbon film incorporates hydrogen, the better to distinguish the claimed film from crystalline diamond deposition films.

The amendments to the drawings are to correct to Fig. 1 as required by the Examiner.

In turn, the specification has been amended to accord with the revisions made to the claims, and with the corrections made to Fig. 1.

Claim Objections

Claim 5 was objected to for reciting the singular "multi-layer film" as originally filed, instead of the plural "multi-layer films" as is necessary to accord with the revisions to claim 1, from which claim 5 depends, made in Applicant's reply to the previous Office action. Claim 5 has been amended as required.

Applicant's representative is grateful for the Examiner's pointing out, via an objection made under 37 C.F.R. § 1.52(b)(2)(i), that Applicant's amendment in reply to the previous Office action was not in the correct format as stipulated under that section of the rules, and apologizes for the inconvenience caused in consequently having made the Listing of Claims so difficult to read. The present reply is being presented in the correct format as required by the Examiner.

Claim Rejections - 35 U.S.C. § 112

Claims 1 and 6 were rejected for ambiguity in reciting dielectric multi-layer films disposed on *either* side of a magneto-optical section, since Applicant's invention requires the films to be disposed on *each* side of the magneto-optical section, and nothing else in the claim would have precluded the recitation from reading on dielectric multi-layer films disposed *unilaterally* on the magneto-optical section. Accordingly, "disposed on *either* side" has been amended to "disposed on *each* side" as suggested by the Examiner.

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It is respectfully submitted that the rejection in turn of claims 3-5, 8, 10-13, 18 and 19 as having inherited the same ambiguity through their dependency from either claim 1 or 6 is overcome by the above-described amendment to these claims.

Claim Rejections - 35 U.S.C. § 102

Claims 16 and 17; Anthony et al. '731

Claims 16 and 17 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 5,273,731 to Anthony et al.

As analyzed under this section of the Office action, Anthony et al. disclose films with absorbance values that, mathematically converted, appear to be within the extinction-coefficient range recited in claim 16 in characterizing the claimed diamond-like carbon thin film.

Notwithstanding that it can be shown that the extinction coefficients as set forth in Embodiment 4 of the present invention are at 1200, 1500 and 1700 nm about 50%, 25% and 10% lower respectively than those of Anthony et al., such comparisons are obviated by the fact that Anthony et al. is directed to—and only to—*polycrystalline diamond* films, whereas the present invention, in entirely significant contrast, is as recited in claim 16 directed to *diamond-like carbon (DLC)* films.

In contrast to polycrystalline diamond films, which by definition are *crystalline*, DLC films are *amorphous* (non-crystalline).

Although it is now the case that in the art DLC films are understood as being amorphous, Applicant grants that the use of the term DLC appears to not always have been so limited. For example, U.S. patent 5,098,737, which issued in 1992, states, "While natural diamond is a generally well defined substance, diamond-like carbon films are not well defined, possibly because the many different methods of preparation which contribute unique aspects to the product." (Emphasis added.) This patent goes on to state,

In the present application "diamond-like carbon" has been used as a generic term for a material having some of the physical characteristics of diamond. . . . [T]he use of the term "diamond-like carbon," should not be understood to indicate a specific type of structure (e.g., amorphous, microcrystalline, large-grain polycrystalline, or single crystal) or specific types of compositions, such as percentage of hydrogen or other impurities in interstitial sites in grain boundaries.

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On the contrary, DLC films as disclosed in the present invention are *amorphous*; Applicant disclaims mono- or polycrystalline diamond films.

The term "DLC" film as now used in the art means an amorphous film that can be deposited onto substrates at temperatures as low as room temperature. In contrast, the polycrystalline film according to Anthony et al. is deposited at a 600°C to 1000°C substrate temperature. In the present specification, the term "amorphous" is not used, but because low-temperature CVD deposition *cannot* result in mono- or polycrystalline diamond, it is respectfully submitted that persons skilled in the art would expect the low-temperature CVD deposition used in the present invention to produce the claimed DLC film to be capable *only* of producing amorphous DLC.

Moreover, it is understood in the art that DLC materials can contain varying amounts of hydrogen, unlike crystalline diamond materials. In paragraph [0104] under Embodiment 4 of the present specification, the fact that the DLC thin film actually fabricated according to the invention contains hydrogen is clearly set forth.

In sum, then, it is respectfully submitted that the DLC recited in claim 16 is *amorphous*, and that even though the term "amorphous" does not appear in the specification, the fact that the DLC of the present invention is amorphous would be apparent to a person skilled in the art from the now generally accepted meaning of the term, from for example the film-formation conditions given in the specification in paragraph [0100], and from the fact the DLC films may contain hydrogen. Claim 16 has been amended to recite the limitation that the claimed DLC film contains hydrogen.

For the foregoing reasons, it is believed that Anthony et al. do not anticipate the diamond-like carbon thin film of the present invention as recited in claim 16.

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Claims 1, 5, 6 and 13; Matsushita et al. (2002/0063941A1)

Claims 1, 5, 6 and 13 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Pat. App. Pub. No. 2002/0063941 A1 to Matsushita et al.

In the present specification, paragraph [0055], herein amended, states,

[T]he Faraday rotator 30 is constituted by arranging the dielectric multi-layer films 30-2 on either side of the magneto-optical part 30-1 parts 30-1, 30-1 to create a resonant structure. The resonant structure of the dielectric multi-layer films 30-2 enables localizing in the magneto-optical part 30-1 section 30-4 incident light of a given wavelength. This as a result makes it possible to selectively rotate the polarization plane of incident light of a given wavelength.

The Examiner appears to be interpreting the configuration of dielectric films on either side of a magneto-optical film as a Fabry-Perot filter. Such a configuration is described as a "Fabry-Perot resonator structure" 21/22 in Matsushita et al. (paragraph [0046]). Then the Office action points out, as stated in column 5, lines 53-55 of U.S. Pat. No. 6,215,592 to Pelekhaty (cited as background art), "It is known that a Fabry-Perot filter will transmit at a number of resonant frequencies." The filter transmission peaks at the resonant frequencies are separated by, as the Office communication also points out, the free spectral range (FSR).

On these grounds, it is asserted that the configuration disclosed in Matsushita et al. would have "a response that is periodic in frequency."

The present invention, in contrast, provides a *selectively resonant* structure, which is different from a Fabry-Perot structure that yields a response in which there are multiple transmission peaks at resonant frequencies, periodically separated by the FRS. (An example of the latter is shown in Fig. 3 of the Pelekhaty patent.)

Put differently, the transmission peaks illustrated in Figs. 2-7 of the present specification are not merely a periodic response in which the peaks are separated by the FRS, but represent the *selectively resonant* responses that are achievable with the Faraday rotator recited in claim 1 and its dependent claims, and with the optical isolator recited in claim 6 and its dependent claims. The structure according to the present invention as now recited in these claims is *selectively resonant*, and not merely the naturally occurring periodic response stemming from a conventional Fabry-Perot structure.

Claims 1 and 6 now recite an especially configured magneto-optical section, and dielectric multi-layer films,

disposed on each side of said magneto-optical section *in an arrangement together with said magneto-optical section predetermined to create a*

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selectively resonant structure for localizing within said magneto-optical section incident light of at least two wavelengths.

It is respectfully submitted that nowhere does Matsushita et al. disclose an optical isolator—nor a Faraday rotator—configured to create a *selectively resonant* structure as set forth in claims 1 and 6.

Claim Rejections - 35 U.S.C. § 103

Claims 4 and 10: Matsushita et al. in view of Ricoh (JP 11-030770 A)

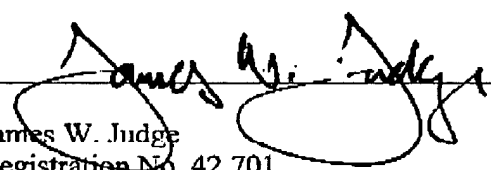
Claims 4 and 10 were rejected under 35 U.S.C. § 103(a) over the Matsushita et al. reference in view of Japanese Pat. App. No. Pub. H11-030770 in the name of Ricoh Co., Ltd.

Applicant addresses the rejection of claims 4 and 10 under this section by urging that as the independent claims from which these claims depend should be held allowable for the foregoing reasons, the rejections are rendered moot.

Applicants gratefully acknowledge that claims 14, 15, 20 and 21 are indicated in the Office action as being allowable. Nonetheless, for the foregoing reasons it is believed that all the pending claims should be held allowable. Accordingly, Applicants courteously urges that this application is in condition for allowance. Reconsideration and withdrawal of the rejections is requested. Favorable action by the Examiner at an early date is solicited.

Respectfully submitted,

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